

Claims

1. A method of synchronizing a digital audio signal with a corresponding digital video signal comprising:

temporarily storing an audio frame in a digital signal processor (DSP) prior to encoding;

5 setting the encoding parameters of a digital signal processor prior to receiving a start command from a host;

 receiving the start command from the host instructing the digital signal processor to begin encoding the audio frame in response to a first video synchronization signal;

10 receiving the first video synchronization signal at the digital signal processor;

 encoding the audio frame upon receiving the first video synchronization signal.

2. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, further comprising transmitting a boot command from the host to the digital signal processor.

3. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 2, wherein the boot command resets a buffer of the DSP along with a controller.

4. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 2, wherein the controller is operable to accept and transfer the audio frame and communications from and to the encoder.

5. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 2, wherein the buffer is operable to store and transfer the audio frames.

6. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 2, wherein the boot command activates a program interface that facilitates communications between the host and the DSP.

7. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 2, further comprising

sending a ready signal from the DSP back to the host confirming the execution of the boot command.

8. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, further comprising transmitting video synchronization signals to the audio encoder.

9. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, further comprising communicating a plurality of encoding characteristics of the audio frame to the host.

10. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 9, wherein the encoding characteristics reflect the frequency and bit rate of the audio frame.

11. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 10, wherein the bit rate of the audio frame corresponds to its rate of compression.

12. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, further comprising sending a preparatory command to the encoder that sets a plurality of encoding parameters of the encoder according to the encoding characteristics of the audio frame.

13. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, wherein the encoding parameters reflect characteristics of the audio frame such as frequency and bit rate.

14. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, wherein host uses the encoding characteristics to establish new encoding parameters, use default encoding parameters or repeat the encoding parameters from a previous application.

15. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, wherein the first video synchronization signal is the next generated video synchronization signal immediately following the transmission of the start command from the host.

16. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, further comprising transmitting a status signal back to the host when the encoding parameters of the encoder are set.

17. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, wherein the beginning of the audio encoding process coincides with the same video synchronization signal that marks the beginning of the video encoding process.

18. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 1, wherein the host is any suitable microprocessor.

19. A method of synchronizing a digital audio signal with a corresponding digital video signal comprising:

receiving a stop command from a host instructing the encoder to count the number audio samples of the audio frame occurring subsequent to the occurrence of a second video synchronization signal.

receiving a second video synchronization signal at the digital signal processor;

counting the number of samples of an audio frame representing a time duration equal to the difference between the second video synchronization signal and a last encoded sample of the audio frame.

20. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, further comprising discarding the counted samples prior to combining the remaining portion of the audio frame with the video frame in anticipation of playback.

21. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, wherein the counted samples contain encoding instructions.

22. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, wherein the ending of the audio encoding process coincides with the same video synchronization signal that marks the ending of the video encoding process.

23. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, wherein the host is any suitable microprocessor.

24. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, wherein the stop command further instructs the DSP to cease encoding processes upon encoding the last sample of the audio frame.

25. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, further comprising transmitting the encoded audio frame to a multiplexor to be combined with a corresponding video frame.

26. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, further comprising transmitting video synchronization signals to the audio encoder.

26. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 19, wherein the second video synchronization signal is the next generated video synchronization signal immediately following the transmission of the stop command from the host.

27. A data transmission apparatus for synchronizing an audio signal with a video signal, comprising:

an audio generating means for generating an audio frame;

a video generating means for generating a video frame and a plurality of video synchronization signals;

a digital signal processor operable to temporarily store the audio frame, then encode the audio frame in response to a first video synchronization signal;

a host microprocessor operable to send command signals to, and to set the encoding parameters of the digital signal processor application.

28. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 27, wherein the digital signal processor must first receive a start command from a host prior to encoding the audio frame.

29. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 27, wherein the first video synchronization signal is the next generated video synchronization signal immediately following the transmission of the start command from the host.

30. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 27, wherein the DSP comprises an encoder, a buffer and a controller.

31. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 30, wherein the encoder includes a number of registers for storing data being processed, an arithmetic and logic unit (ALU) for performing logical (e.g., AND, OR, XOR) operations as well as arithmetic (addition, multiplication, division) operations, and a parallel-connected bit shifting unit for performing bit shifting and masking.

32. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 30, wherein the controller is operable to accept and transfer audio frames and communications from and to the encoder.

33. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 30, wherein the buffer is operable to store and transfer audio frames.

34. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 27, wherein a plurality of video synchronization signals are generated periodically.

35. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 27, wherein the digital signal processor transmits the audio frame to the multiplexor upon encoding the audio frame.

36. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 27, including a programming interface present between the digital signal processor and the host to facilitate communication of a plurality of commands and status signals.

37. A data transmission apparatus for synchronizing an audio signal with a video signal according to above claim 36, wherein the status signals include responses from the digital signal processor to host confirming the execution of the host's instructions.

38. A data transmission apparatus for synchronizing an audio signal with a video signal according to the claim 36, wherein the plurality of

commands include communications from the host to the digital processor authorizing the execution of processing functions, requesting status signals and setting encoding parameters.

39. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 27, further comprising a demultiplexor means for separating the audio signal and the video signal from a multiplexed signal in accordance with a control signal, prior to generation.

40. A data transmission apparatus for synchronizing an audio signal with a video signal, comprising:

an audio generating means for generating an audio frame;

a video generating means for generating a video frame and a plurality of video synchronization signals;

a digital signal processor (DSP) operable to count the number of samples of an audio frame representing a time duration equal to the difference between a second video synchronization signal and a last encoded sample of the audio frame in response to receiving a stop command;

a host microprocessor operable to generate and transmit the start command to the digital signal processor;

multiplexor means for combining the encoded audio signal with the video signal.

41. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 40, wherein the digital signal processor transmits to the host a value corresponding to the time required to process the counted audio frames.

42. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 40, wherein the second video

synchronization signal is the next generated video synchronization signal immediately following the transmission of the stop command from the host.

43. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 40, wherein the DSP comprises an encoder, a buffer and a controller.

44. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 43, wherein the encoder includes a number of registers for storing data being processed, an arithmetic and logic unit (ALU) for performing logical (e.g., AND, OR, XOR) operations as well as arithmetic (addition, multiplication, division) operations, and a parallel-connected bit shifting unit for performing bit shifting and masking.

45. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 43, wherein the controller is operable to accept and transfer audio frames and communications from and to the encoder.

46. A method of synchronizing a digital audio signal with a corresponding digital video signal according to claim 43, wherein the buffer is operable to store and transfer audio frames.

47. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 40, wherein a plurality of video synchronization signals are generated periodically.

48. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 40, wherein the digital signal processor transmits the audio frame to the multiplexor upon encoding the audio frame.

49. A data transmission apparatus for synchronizing an audio signal with a video signal according to claim 40, including a programming interface present between the digital signal processor and the host to facilitate communication of a plurality of commands and status signals.